Native Compounds in Turkish Sign Language (TİD): A classification based on headedness*

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(Received 14 October 2017; accepted 8 June 2018)

ABSTRACT: This paper investigates the position of the structural head and its connection to the semantic head in 127 compounds in Turkish Sign Language (TİD). To eliminate language contact effects, we selected compounds that have monomorphemic counterparts in Turkish. The findings are: (i) Endocentric compounds tend to be head-final, (ii) Exocentric compounds tend to be head-initial, (iii) compound internal order, in some well-defined cases, is affected by the lexical semantics of one of the components. In addition, we identify two classes of compounds, cranberry compounds and descriptive compounds, and finally, point to the similarities between compound and phrase structure with respect to the head parameter.

Keywords: Turkish Sign Language, compounds, headedness, cranberry compounds, descriptive compounds

Türk İşaret Dili'nin Öz Dağarcığındaki Bileşik Sözcükler: Baş değiştirgenine göre bir sınıflandırma

ÖZ: Türk İşaret Dili'nde (TİD) 127 bileşik sözcüğün yapısını, ulamsal başın konumu ve anlamsal başın varlığı açısından inceledik. Olası dil etkileşimi etkenlerini elemek için yalnızca TİD'de iki kökten oluşup Türkçe karşılığı tek kök olan kavramları incelemeye aldık. Bulgular: (i) İçbaşlı bileşiklerin çoğunluğunun başı sonda; (ii) Dışbaşlı bileşiklerde baş ilk sırada; (iii) Anlamsal ulam sırayı etkilemekte. Ayrıca bağımlı köklerden oluşan ve 'açıklayıcı' (descriptive) adını verdiğimiz iki tür bileşik sözcük tanımladık.

* We would like to thank the audiences at Theoretical Issues in Sign Language Research, Melbourne, 2016 and Workshop on Phrasal Compounds, Mannheim, 2015 for their comments. We would also like to thank two reviewers for their input. This research was supported by Boğaziçi University Research Fund BAP 11500, and Sign-Hub Project (European Union's Horizon 2020 research and innovation programme under grant agreement No 693349).

We would like to thank our informants Elvan Tamyürek Özparlak and Sevinç Lamia Yücealtay, and Yusuf Ermez for reproducing TİD signs and sharing his linguistic insights with us.

The handshape fonts are created by CSLDS, CUHK.

http://dx.doi.org/10.18492/dad.378853

Dilbilim Araştırmaları Dergisi, 2018/1, 1-28.

Baş değiştirgeninin bileşik sözcük ve öbek yapılarında benzerliğini bulguladık.

Anahtar kelimeler: Türk İşaret Dili, bileşik sözcükler, başın konumu, tek öğesi anlamsız bileşik sözcükler, açıklayıcı öğeli bileşik sözcükler

1 Introduction

Turkish Sign Language (TİD) has been used in Turkey since at least 1889, the time of the establishment of a school for the deaf and blind (Miles, 2009; Zeshan, 2002; İlkbaşaran & Taşçı, 2012, among others), although it is known that some sign language was used several centuries earlier. As of 2003, the population of sign language users is estimated to be between 187.500 and 337.500. Since official surveys do not have specific questions about sign language, these figures are based on medical and sociolinguistic studies (İlkbaşaran, 2015; Gürboğa & Kargın, 2013; Kemaloğlu, 2016) in addition to the official surveys about disabilities (Ömer & Aysoy, 2002). TİD was first officially recognized in The Disabilities Act in 2005. Further regulations about education and interpreting services followed in later years. These legislative measures, alongside the efforts of the Deaf community, have brought TİD to a much higher status of recognition in the last decade. However, the status of TİD is still far from ideal in terms of linguistic human rights (İlkbaşaran, 2015; Kemaloğlu, 2016; Kubuş, İlkbaşaran, & Gilchrist, 2016). Parallel to the positive developments in the recognition of TİD, scientific research on TİD has also flourished in the last decade, producing many works on all aspects of grammatical structure (cf. Arık 2013, 2016). Here we would like to contribute to this body of literature by examining the structural properties of TİD compounds.

Various studies have been conducted on the structure of sign language compounds since the seminal work of Klima & Bellugi (1979). While the studies before the 1990's generally focused on phonological properties, later works have also investigated semantic and syntactic aspects of compounds (Liddell, 1984; Liddell & Johnson, 1986; Brennan, 1990; Meir, Aronoff, Sandler, & Padden 2010; Vercellotti & Mortensen, 2012; Tkachman, 2016). In this paper, we will investigate compounds in TİD[1] to understand whether the semantic aspects of the lexemes inside a compound and the relation between

[1] The abbreviations we use in this paper are: ABSL: Al-Sayyid Bedouin Sign Language, ASL: American Sign Language, BSL: British Sign Language, CL: classifier, CM: compound marker, CT: sign with body contact, DP: determiner phrase, ISL: Israeli Sign Language, NGT: Sign Language of the Netherlands, TİD: Turkish Sign Language, ^: morpheme boundary, /: in glosses, separator of the different meanings of a morpheme.

these lexemes affect compound internal ordering. Secondly, we present a classification of the compounds in terms of the relation that the head of the compound has to the compound as a whole, i.e. whether the compound is a hyponym of the head or not.

In order to understand the role of ordering in compounds and their semantic correlates, we looked at 127 native compounds. Our definition of 'native', for the puposes of this paper, refers to compounds whose translations to Turkish are monomorphemic (non-compound) words. The choice of narrowing down our investigation to only these compounds was to guarantee that our results would bypass the possible effects of language contact at the structural level. Needless to say, there are many more compounds in TİD, but we eliminated these from our study, as their Turkish counterparts were also compounds. Our results reveal various tendencies in the ordering of the constituents in compounds based on their formational and (lexical) semantic properties.

The paper is organized as follows. In Section 2 we summarize previous findings on compounding in sign languages, followed by the introduction of our database and the framework we adopt in Section 3. We present our findings in Section 4, followed by a discussion of our findings in Section 5. Section 6 concludes the paper.

2 Compounding in Sign Languages

Compounding is the most prevalent word formation process in the languages of the world, both signed and spoken (Libben, 2006; Bauer, 2009) and it is the first word formation process that appears in young languages such as pidgins and creoles (Plag, 2006). Possibly due to these properties, compounds were one of the earliest construction types that were subjected to a structural investigation in sign languages (Stokoe, 1960; Frishberg, 1975; Klima & Bellugi, 1979; Liddell & Johnson, 1986). Klima & Bellugi's (1979) investigation of ASL (American Sign Language) compounds defines a compound in terms of two stems forming an integral lexical unit with a specialized meaning and with particular rhythmic properties. Being an integral lexical unit means that another sign can not be inserted between the constituents. Another indication of compoundhood is specialized meaning as in BLUE^SPOT 'bruise' or SLEEP^DRESS 'pajamas'.

The phonological characteristics of compounds in ASL according to Klima & Bellugi (1979; henceforth K&B) and Liddell & Johnson (1986; henceforth L&J) are, briefly presented below. Similar phonological processes occur in TİD as well (Kubuş, 2008):

(i) Prosodic changes (deletion of movement and repetition): The repeated segments are deleted and/or shortened in duration in the first

constituent of the compound, as in RED^SECRET ‘strawberry’ (K&B: 214) and GOOD^NIGHT ‘(have a) good night’ (L&J: 460), regardless of whether the first constituent is the semantic head or not. Moreover, when a segment involves body contact in the initial constituent, the contact feature is obligatorily retained while other features are deleted. As for the second constituent in a compound, these may lose repetition and sometimes have added stress, as in BLUE^SPOT ‘bruise’ (K&B: 216). The first constituents always lose stress.

(ii) Changes in handshape (handshape assimilation): The handshape features can spread between the constituents in compounds. For example, in THINK^SELF ‘use one’s own judgment’ (L&J: 457), the handshape feature (index finger) of the second element assimilates to the first element (thumb), resulting in a handshape with both index and thumb. L&J note that these processes are not unique to compounding and do not occur across the board in their compound data.

(iii) Changes in location (location assimilation): Place of articulation can spread from one element to another. For example, in YELLOW^HAIR ‘blonde’ (L&J: 481), the first constituent deviates from the chest location to the head location, copying the place feature of HAIR. Location assimilation is optional like handshape assimilation.

(iv) Changes in handedness (handedness assimilation): The non-dominant hand (h2) of the second constituent spreads to the first constituent in compounds where one constituent is one-handed and the other two handed (in either order). Examples are BLACK^NAME ‘bad reputation’ (K&B: 217) and THINK^TOUCH ‘obsessed’ (L&J: 476).

Alongside sequential combinations which are the focus of our study, there are other types of polymorphemic items. These are made up of simultaneously articulated components, which we do not analyze in this study (see also Meir, 2012). One type results from the extensive feature and segment deletions in sequential compounds mentioned above. Such forms may result in compounds that look phonologically like single signs (e.g. THINK^MARRY (L&J: 490)). Thus, alternative analyses consider these and related constructions as blends (Uyechi, 1996), clippings (Taşçı & Göksel, 2014), or portmanteau words (Liddell, 1984). There are also initializations, where a handshape of the manual alphabet combines with the non-handshape features of another sign. For example, L^BLUE ‘navy blue’ *lacivert* is produced with the  -handshape of the letter L (the first letter of the related word *lacivert* in Turkish), and the circular movement of BLUE. Other than that, in a rarely attested type, core lexical items can be simultaneously combined as in the NGT (Sign Language of the Netherlands) compound SATURDAY(h1)^SUNDAY(h2) ‘weekend’ (Quer

et al., 2017: 179) and in MINICOM from BSL (British Sign Language) (Brennan, 1990: 151) in which each hand expresses a constituent at the same time. Numeral incorporation is another type of polymorphemic combination where a numeral is simultaneously combined with another sign, which is usually a time related term (Liddell, 1996). An example from TİD would be THREE^WEEK 'three weeks' where the handshape of THREE is incorporated into the handshape of the sign WEEK.

Another type of simultaneous polymorphemic item which we do not analyze in this study is Type-3 signs (Battison, 1978) such as the sign for CHICKEN in TİD, where h1 (a bent index finger representing the beak of a chicken) taps on h2 (flat hand that represents the ground). The sign resembles picking with the beak. These signs are considered to be lexicalizations of classifier constructions. Whether these forms can be called compounds depends on how a stem is described. Vercellotti & Mortensen (2012: 555) voice the wideheld view that only inflectional morphology is simultaneously articulated and derivational morphology and compounding are 'typically concatenative'. The opposing view is that compounding can also be simultanously articulated. According to this view, classifiers coarticulated with other signs, as long as they form lexemes, should be considered simultaneous compounds (Brennan, 1990; Johnston & Schembri, 1999). We take this view and discuss it further in Taşçı, Göksel, & Gökgöz (frth.). In order to avoid any further classifications, we limit the current work to *sequential* native compounds.

Regarding sequential compounds, it has been observed that the phonological phenomena concerning reduction and the duration in such compounds compared to the reduction that occurs between two individual items that happen to be adjacent in a phrase may not be a reliable indicator of compounding. It has been noted that some of these factors can occur in cliticization (Sandler, 1999) or in connected discourse. Moreover, our knowledge of the phonological criteria of compoundhood does not offer a definitive criterion, but rather points to tendencies (Lieber & Štekauer, 2009). In more recent works on compounding, the focus has shifted from phonological to morphological aspects. One notable work is Vercellotti & Mortensen (2012) who use the analysis of Bisetto & Scalise (2005) and Scalise & Bisetto (2009) to classify ASL compounds (see 3.2 for the classification of compounds). Following from these works, in our previous studies, we investigated polymorphemic stems in TİD in the light of the combinatorial aspects of complex lexemes (Taşçı, 2012; Taşçı & Göksel, 2014; Göksel & Taşçı, 2016).

We now turn to the focus of the investigation in this paper, the semantic and syntactic properties of native compounds.

3 Methodology

For the purposes of this study, we use a morphological criterion for identifying compounds. What we call compounds are conventionalized stem combinations that occur in the lexicon.

3.1 Database

In compiling the compounds in TİD, we first collected the data from dictionaries (Özyürek, İlkbaşaran, & Arık, 2004; European Sign Language Center (2010); Türk İşaret Dili Kaynak Sitesi, Boğaziçi University) and course materials on TİD (Dikyuva & Zeshan, 2008). We then consulted three native signers in order to verify each compound and formed a list of 127 compounds that were accepted by at least one of the three participants. The instruction was "did you see this sign before?". The informants also provided some compounds that were not on the websites.[2]

Our database consists of 127 lexicalized items in TİD made up of two stems. These 127 compounds were the only items whose corresponding Turkish equivalents were monomorphemic. The reason for this was to avoid any possible ordering conventions that would have been borrowed from Turkish since some compounds in sign languages are translated verbatim from the compounds of the surrounding spoken language. In other words, we eliminated any TİD compound that would translate into Turkish as a compound. To give an example, we eliminated an item like BED^ROOM since this concept is expressed also as a compound to Turkish, which is *yatak^oda^sı* 'bedroom (bed^room^CM). Such calques make it difficult to derive generalizations about the properties of compounding in the sign language in question as they may be manifesting the properties of the surrounding spoken language, such as the position of the structural head and the syntactic categories of the components of the compound.[3]

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[2] Not all compounds in web dictionaries were accepted by our informants, although these unacceptable word combinations were judged to have transparent meanings. For these cases, the intuition of our informants was that they would understand a particular form in a conversation but they would not have seen it. We excluded these forms from our study, restricting the database to the lexicalized forms.

[3] One of our reviewers has pointed out that another citerion for nativeness could have been 'reversal of order' compared to Turkish compounds. These compounds would have to be endocentric left-headed compounds; left-headed, because Turkish compounds are right-headed, and endocentric, because we have found that left-headedness has a correlation with exocentricity. In our database, endocentric left-headed compounds exist, but they are rare. Moreover, phonological factors can be at play in determining the order of the head in these rare cases

By eliminating such compounds from the study, we are not claiming that they are not part of the native vocabulary of TİD. The similarity in the combination of the parts is not necessarily a sign that a compound is a calque. Such structurally identical combinations occur across many languages and they are still part of the native vocabulary as they are the outputs of the compounding strategies shared by many languages. A concept such as a 'watch worn on the wrist' is likely to be expressed as a compound in many languages, which naturally does not indicate lexical borrowing. Pairs of identical exocentric compounds (compounds with non-compositional meanings) in a sign language and a surrounding spoken language, on the other hand, are more straightforward indicators of language contact.[4] For example, the compound HEAD^HIT 'to seek the advice of', 'to apply for a position' in TİD is a calque based on the same combination in Turkish *baş^vur*. Thus, to be able to make a claim about the ordering properties of TİD, we narrowed our search to avoid the possibility of language contact effects. We further discuss the basis of our choice in Section 5.1.

In brief, although many compounds that are identical in TİD and Turkish are not the output of borrowing, in order to avoid any possible influence of Turkish, we focused on compounds in TİD whose Turkish counterparts were simplex lexemes (e.g. SOUR^JAR 'pickle' *turşu*). The list of these compounds are given in the appendix.

We would like to note that almost all of the native compounds contain an unavoidable element of language contact, which is mouthing. One such example is given in (4a). A preliminary study on TİD has shown that mouthing is pervasive during conversation, in fact, its domain is not always aligned with the segmental boundaries of a sign (Sevgi & Göksel, frth.). We regard this aspect of compounds orthogonal to our investigation on headedness and the scope of mouthing in native compounds is the subject of another study.

3.2 Framework and Classification

The literature on the classification of compounds is vast (see Scalise & Bisetto (2009) for an overview and a critical analysis of modeling compounds in various works). Here we base our classification on Bisetto & Scalise (2005), a framework which was designed after the investigation of various spoken languages and which was adopted for the analysis of ASL by Vercellotti & Mortensen (2012), with some emendations and alterations that we will take up shortly.

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[4] This generalization holds, unless it can be shown that there are universal tendencies underlying exocentric compounds and the metaphoric interpretations that they may impart.

Bisetto & Scalise (2005) not only has the advantage of characterizing different types of compounds along the same parameters, but also separates syntactic, categorial, and semantic criteria in a principled manner, which proved to be problematic in previous works. Briefly, the model of Bisetto & Scalise (2005) draws a distinction between the following three types:

(i) subordinate compounds that embody an *of/for* relationship between the constituents (e.g. *bookseller* 'a seller of books', corresponding to verbal nexus (synthetic) compounds; *bookshelf* 'a shelf for books' corresponding to root compounds),
(ii) attributive/appositive compounds which either have a *which is* relationship or an *is like* relationship, respectively (e.g. *black hole* 'a hole which is black'; *mushroom cloud* 'a cloud like a mushroom'), and,
(iii) coordinate compounds where the two constituents have an equal standing that can be recast as an *and* relationship (e.g. *singer-songwriter* 'a person who is a singer and a songwriter').

Each type is then divided into two further categories: endocentric, where one of the constituents (the head) is a hypernym of the denotation of the compound (e.g. a book shelf is a kind of shelf, which makes the head *shelf* in *bookshelf* a hypernym), and exocentric, where the entity denoted by the compound does not correspond to either of the constituents (e.g. *pigtail*, which is the name given to a particular hairstyle, is neither a pig nor a tail). Crucially, in this model, semantic headedness (endocentricity and exocentricity) and syntactic headedness (whether the compound *structurally* has a head or not) are separate parameters (e.g. *pigtail* is exocentric but has a syntactic head (*tail* of a pig), *mother-daughter,* a coordinate compound, lacks a head as the compound neither means 'mother', nor 'daughter').

Vercellotti & Mortensen (2012), while adopting this framework for the analysis of ASL compounds take issue with certain aspects. We will not go into the internal asymmetries that they point to, but rather focus on the following, the first two being most relevant to sign languages: (i) the difficulty of distinguishing between syntactic categories in sign languages, and therefore between, e.g. verbal nexus and ground compounds, (ii) a gap in the classification, namely, the grid of appositive compounds, i.e. the lack of such forms in ASL as *mushroom cloud*, and (iii), the difficulty of distinguishing metaphoric from literal expressions which makes it difficult to decide whether a particular compound is endocentric or exocentric, e.g. *sea horse* may be considered endocentric on the grounds that it is like a little horse in the sea. Following these observations, they propose a model where the first level of distinction (subordinate-attributive-coordinate) holds with the exception that

the category appositive is elimitated, and the second level is divided into further subgroups as expressed predicate and unexpressed predicate, eliminating the categories verbal nexus and ground. The category expressed predicate refers to compounds that include a verb or a copula (e.g. *bookseller*, blackboard (a board that is black), and an unexpressed predicate refers to those that do not contain either of these, but contain a predicate in the paraphrase (e.g. *windmill* = mill (that is powered by) wind).

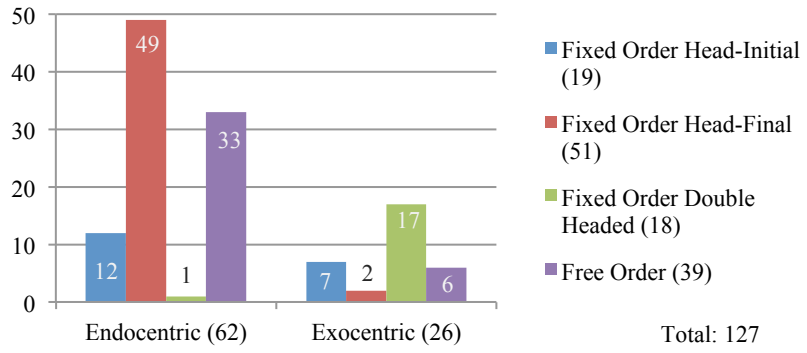
Here we will not evaluate either of these models as they both contain the crucial ingredients of our analysis: headedness and endo-/exocentricity. In our study we focused on these two parameters, namely, syntactic and semantic headedness, in order to understand whether there is a correlation between them. We, crucially, also point to further types not covered by either of the classificatory models above.

4 Findings

4.1 Endocentricity and Headedness

The frequencies of compounds according to endocentricity, headedness, and whether the order is fixed are presented in Figure 1 below.

Figure 1. Frequencies of ordering patterns in TİD Compounds (Total numbers are given in parantheses).



The answer to our question regarding the types of semantic relationships expressed in compounding shows that, roughly, three quarters of compounds are endocentric (95 out of 127) and one quarter is exocentric (32). Within the group of 95 endocentric compounds, the majority (62) have fixed order out of which 12 are head-initial (CHICKEN^SMALL 'chick'), 49 are head-final (GOLD^STORE 'jewellery store'), and one is double-headed (M^ARCHITECT 'architect'; M is for the Turkish word *mimar* 'architect'). The remaining 32 endocentric compounds have free order (SCREEN^COMPUTER and COMPUTER^SCREEN 'computer monitor'). Within the 32 exocentric compounds, most compounds (26) have fixed order, while six exocentric compounds have free order (GOLD^SILVER and SILVER^GOLD 'jewellery store'). Within the 26 fixed order exocentric compounds, seven are head-initial (MAN^TALL 'elder brother'), two are head-final (SOUND^EMIT 'loudspeakers'), and 17 are double-headed or headless (RED^CL.ROUND.OBJECT[5] 'tomato', see below (1)).

(1)

RED ^ CL.ROUND.OBJECT = 'tomato'

Leaving aside the variable order compounds, we can make the following generalization: endocentric compounds are overwhelmingly head-final, and exocentric compounds are overwhelmingly head-inital. As for the flexibility of order, overall 69% of the compounds have fixed word order.

The endocentric compounds in our database fall within two categories. One of these is the type with a hyponym-hypernym relation described above, namely where one of the constituents (e.g. *shelf*) is a superordinate category

[5] Classifiers (CL) in sign languages denote classes of objects based on shape or handling properties. Entity classifiers are single handshapes that refer to classes of entities such as flat objects (), long thin objects (), round objects (). Another type of classifier is Size and Shape Specifiers that indicate a partial or full contour of the referred entity, or the shape of the object by a single handshape. In the literature there is, at times, a categorial overlap in the usage of the terms entity classifier and Size and Shape Specifier (Quer et al., 2017), thus we used 'classifier' (CL) solely as an umbrella term that encompasses both entity classifiers and Size and Shape Specifiers.

name of the entity denoted by the compound (e.g. *bookshelf*). The head of the compound is given in bold glosses. Examples of this type are given below:

(2) a. GOLD^**STORE** = 'jewellery store' (head-final, fixed order)
b. SLEEP^**CLOTHING** = 'pajamas' (free order)
c. **MEAT**^OPERATE-MINCER = 'minced meat' (head-initial, fixed order)

We expand on the patterns above in Section 5.4. The other type of endocentric compound uses one of the constituents to denote the compound, which we expand on below.

4.2 Descriptive Compounds

Another type of endocentricity that exists in TİD is a type which encodes an identity relation between one of the constituents and the compound as a whole. In these compounds, one of the constituents on its own can also be used to refer to the entity denoted by the whole compound. We take this item to be a head, by definition. Some examples are given below:

(3) a.


GREEN ^ **GRASS** = 'grass'

b.


POTATO ^ PEEL = 'potato'

c. AIRPLANE^**PILOT** = 'pilot'

The lexical item denoting the concept 'grass' can be the sign GRASS or the compound GREEN^GRASS. Hence GREEN is redundant. Similarly, the concept 'potato' is denoted by the compound POTATO^PEEL or only by the sign POTATO. Of the 95 endocentric compounds, three quarters (76 in number) are of this type. We call these 'descriptive compounds'. The typical

property of such compounds is that the item that is the non-head further describes a property of the head. In certain descriptive compounds we observed phonological changes of input elements. For example, the second element of DIRECTOR^CHIEF = 'director' is signed in the upper signing area as a result of progressive location assimilation. To our knowledge, in the sign language literature, forms similar to descriptive compounds are mentioned only in relation to name signs in ASL by Supalla (1990), e.g. WILLIAM^SMALL 'William the Small' and N^LIE 'Nixon the liar.' Here we extend this observation to common nouns and other categories. We discuss this point further in Section 5.2.

In Table 1, we schematize the difference between the compound types we discussed so far.

Table 1. Compound types

Endocentric		Exocentric
Hyperonymic	Descriptive	
[X,Y] ⊂ Y	[X,Y] = Y	[X,Y] = Z
GOLD^STORE 'jewellery store'	POTATO^PEEL 'potato'	SOUR^JAR 'pickle'

4.3 Lexical-Semantic Properties as a Predictor of Order

There seems to be a tendency to place items with particular semantic features in one position within the compound rather than the other. In other words, certain (lexical) semantic criteria play a role in the position of a particular constituent. These are items denoting cues about shape via classifiers (TEAR^**CL.ROUND.OBJECT** = 'onion'), action/motion denoting items (SOUND^**SEND** = 'loudspeaker'), human-related terms (SCHOOL^**CHILD/STUDENT** = 'student'). We found that shape, action/motion denoting items, and human-related terms overwhelmingly appear as the final item within a compound. As a side note, colour terms tend to occur as the first item in the compound (GREEN^**GRASS** = 'grass') in five compounds. The figures are given in Table 2.

Table 2. Frequency of compounds categorized by the semantic property and order of their components

Semantic Features	Fixed Order		Free Order
	Occurs as the first item	Occurs as the second item	
Shape	1	24	9
Action / Motion	2	17	8
Human	1	8	3
Colour	5	0	1

Thus we see tendencies in ordering, depending on the lexical semantic features of one of the components.

4.4 Bound Morphemes in Compounds: 'Cranberry' Morphemes

Finally, we would like to point out a group of compounds in which one of the items has body contact, without this item having a particular, or at least, easily discernible reference. We liken these compounds to the type in which the bound form *cran-* appears in the English compound *cranberry*, standardly referred to as 'cranberry compounds'. We take the element 'contact' in these compounds morphologically to be on a par with the item 'cran-' in compounds containing cranberry morphemes (e.g. *boysen-*, *rasp-*, etc.). Both 'CT-' (body contact) and 'cran-' are bound morphemes that occur in compounds. Following from this, we would like to suggest that the following compounds in TİD, similarly, contain bound morphemes without a denotation.

Such bound morphemes occur in the beginning:

(4) a.

CT(eye) ^

CONTROL = 'control'

b. CT(neck)^SEAL/NOTARY = 'notary'

Based on the composition of these compounds that contain a word and a meaningless part, the 🤌-handshape or 🤏-handshape, we would like to call these compounds cranberry compounds in sign languages. We return to the structure of these in Section 5.2.

4.5 Summary

In this section we presented the results of our classification of native compounds in TİD based on various criteria. To recapitulate, we found the following properties:

- 70% of compounds have fixed order.
- Endocentric compounds are overwhelmingly head-final.
- Exocentric compounds, although much fewer in number, are overwhelmingly head initial.
- Endocentric compounds have a subtype that we call descriptive compounds, which make up the majority of endocentric compounds.
- The following categories tend to occur as the last item in a compound:
  - a classifier
  - an event or action
  - a human denoting term
- The following categories tend to occur as the first item in a compound:
  - a term denoting an animal
  - a color term
- Some compounds contain body contact that occurs in first position, which we liken to cranberry compounds.

5 Discussion

5.1 Descriptive Compounds as a Subgroup of Endocentric Compounds

As mentioned in 4.1.1, descriptive compounds have the property of containing their hypernym. It is interesting to note that a similar compound type has been observed in Turkish as well (Göksel, 2015). These compounds are expressed in the compounding template in Turkish, leaving no doubt as to their morphological category.[6] The relavant part here is that this template in Turkish also expresses compounds that contain their hypernym, e.g. *B^harf^i* (B^letter^CM) 'the letter B' and *Tuna nehr-i* (Danube^river^CM) 'the river Danube', as well as epithets (e.g. *Ali^şapşal^ı* (Ali^fool^CM) 'Ali the fool'. The items in TİD are similar in that they contain their hypernym as one of the components and as the head, but they differ in that the non-head is a description of this head, rather than a member of the set that the head denotes. This is the same case as in Turkish epithetical compounds.

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6 By the compounding template we refer to items with two nouns in Turkish, associated by the compound marker *-(s)i*, e.g. *kahve tepsi-si* (coffee^tray^CM) 'coffee tray', *kuş cıvıltı-sı* (bird^chirp^CM) 'birdsong', etc.

A question that may come to mind in the case of TİD is whether these are compounds or collocations, and whether they are simply used for disambiguation in discourse. The fact that one of the members of these items can be used on its own to refer to the same entity may at first sight shed doubt on whether these are true compounds. Although we have not examined the formational features of input elements in contexts where they are clearly separate lexical items (e.g. comparing PEEL^POTATO = 'potato' with the phrase 'Peel the potato'), what justification do we have for calling the items in (5) compounds when GRASS, POTATO, and PILOT can be used on their own, with no difference in meaning from when they are used with the accompanying words? If these were compounds, would we expect one of the items to be deletable?

(5) a. GREEN^**GRASS/WEED** = 'grass'
b. **POTATO**^PEEL = 'potato'
c. AIRPLANE^**PILOT** = 'pilot'

We approach the question whether these are compounds from two angles: from the point of view of lexicalization, and, secondly, from the question whether compounds can ever omit one of their constituents. With respect to lexicalization, 70% of these items have fixed order which would be less likely if they were not compounds, since fixedness is more common in compounds than collocations (Di Sciullo & Williams, 1987). If the descriptive sign-combinations were not lexicalized, other phonological or semantic factors could yield a particular order. With respect to whether a part can be omitted (e.g. GREEN, PEEL, and AIRPLANE in (5)) it is well known that compounds can also omit elements depending on context in many languages (e.g. English *airplane*/*plane*, *blackboard/board*). We therefore surmise that even if their occurence is motivated by discourse factors, this does not necessarily change the fact that these items are listed, and thus they are compounds.

During a signed conversation, the usage of a descriptive compound (e.g. POTATO^PEEL) instead of its monomorphemic variant (POTATO) may be influenced by discourse factors. One such factor could be that the introduction of a referent in a discourse requires the explicit characterization of that referent (Givòn, 1983; Ariel, 1991; Quinto-Pozos & Reynolds, 2012). To test whether the components of descriptive compounds have a higher level of ambiguity than the components of regular compounds, we compared the average number of the meanings of each compound component as a proxy of the degree of ambiguity. For example, consider the compound STUDENT, composed of the sign BABY/OFFSPRING/SMALL and CHILD/STUDENT. The first element has three, and the second element has two denotations. In other words, the first constituent in isolation can refer to 'baby', 'offspring' or 'small', whereas the

second element by itself denotes 'child' or 'student'. The t-test analysis showed that descriptive compounds have more ambiguous components (M = 1.7, SD = .96) than regular compounds (M = 1.24, SD = .53, $t(226.645) = 4.68$, $p < .001$). Though the tendency is noteworthy, one has to examine conversation data to explicate the nature of discourse factors shaping the usage of descriptive compounds, since there are 15 compounds (20% of descriptive compounds) that have constituents with a single meaning (WARM^SUN 'sun').

5.2 Body Contact as Determiner? Comparing Compounds to Phrases

We would finally like to turn to whether there are any similarities between the internal structure of compounds and phrase structure in TİD. To this end, we return to cranberry compounds described in section 4.4, and first look at other items similar to cranberry morphemes in one or another of their aspects that have been discussed in the literature.

The first comparison which we would like to make in discussing cranberry morphemes is to items referred to as 'lexicalized phonological remnants' (L&J). In terms of their morphological status, these are components of compounds which have form without meaning, and in this respect they have a similarity with cranberry morphemes. However, what we call cranberry morphemes are different in that 'lexicalized phonological remnants' are historical relics whereas this is not the case with the cranberry morphemes that we identified. Moreover, cranberry morphemes have structural affinities to elements of phrases, which we discuss below, and this aspect is not relevant to the description of 'lexicalized phonological remnant'. Another type of item that cranberry morphemes may be likened to is the pointing sign THERE, which is tentatively classified as as a affix (e.g. PRAY^THERE 'Jerusalem' (Sandler, Aronoff, Meir, & Padden, 2011)). In this case, the similarity is solely with the form, as these affixes are contentful. Finally, there are items mentioned in the literature which have pointing towards the head, mouth, or eye as the first element in BSL (Brennan, 1990), ISL (Israeli Sign Language) (Aronoff, Meir, & Sandler, 2005), and ABSL (Meir et al., 2010). Aronoff et al. (2005) call these contact components 'sense prefixes' though most of them do not have a 'componential' discernible meaning (CT(mouth)^bound-form 'cunning') as the instances of pointing in our data. However, they claim that some of these forms are in the process of grammaticalization, such as CT(eye) that has a hortative meaning ('let's do X'). Moreover, the forms almost always result in verbs. These observations do not hold for our TİD data either. The CT components in TİD that we refer to as cranberry morphemes are always combined with meaningful lexical items that can result in verbs as in (6) CONTROL, or nouns as in CT(nose)^POUR 'gas'. TİD compound in (4a) is repeated here in (6).

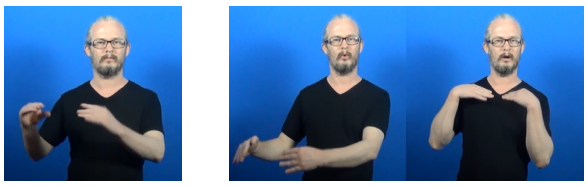
(6) [☝, CT(eye)]^CONTROL = ‘control’

Finally we observed that there is a phonotactically based tendency that places the constituent with body contact in first position. Similarly, Brennan (1990) observed that BSL compounds have a phonotactic tendency to move away from the body. However, it is significant to note that it may not only be phonotactics that places the contact element at the beginning of the compound, at least not in TİD. We suggest that there is a cross-component reason for the morphological and syntactic properties of CT.

The ☝-handshape, which indicates body contact in these compounds, also happens to be the sign for demonstratives in TİD (cf. Özsoy & Nuhbalaoğlu, 2014), as in many other sign languages. Özsoy & Nuhbalaoğlu (2014) propose that TİD has DPs (Determiner Phrase), and show that the determiner (whose exponent is the ☝-handshape) occurs phrase-initially. The ☝-handshape of cranberry compounds also occurs in the initial position, both in exocentric and endocentric compounds that have [☝, CT]. Thus, in these compounds containing the ☝-handshape and body contact, we observe a common ordering pattern with DPs, a fact which may be due to a tendency of compounds mimicking the phonological pattern (pointing/contact in the first position) of DP structure.[7] The syntactic difference is that [☝, CT] as a constituent that does not bear meaning cannot be the head in the compound.

Our claim that the mimicking of DP structure, rather than phonotactics, determines the order is supported by examples where the constituent with body contact occurs in the second item. In these compounds, crucially, the constituent with body contact never has a ☝-handshape but has other shapes. An example is the compound THICK-WOOL^BLANKET ‘blanket’ where the second element in the compound has body contact but is expressed with ✋-handshape:

(7) a.



THICK-WOOL ^ **BLANKET** = ‘blanket’

[7] Note that this parallelism is in compliance with compounding patterns in many languages. The compounding pattern in English and Turkish, for example, directly mimics phrase structure, such that the compound *blackbird* has adjective-noun order, similar to a noun phrase.

Moreover, the contact signs that occur as the second item always have lexical meaning whereas those that occur as the first item usually lack such meaning and they are bound.

5.3 Is There an Overarching Constraint on Order?

We observed other parallels between lexical structure and phrase structure. Following from our findings in section 4.1, we note that there are recurring patterns across phrases and compounds at three levels:

(i) Endocentric compounds tend to be head-final, and the constituents expressing action or motion concepts tend to be in the second position. This is similar to TİD verb phrase structure, which is head-final in TİD (Sevinç, 2006; Açan, 2007; Gökgöz, 2011; 2013; Dikyuva, Makaroğlu, & Arık, 2017).
(ii) Exocentric compounds tend to be head-initial like DPs, and [☝, CT] occurs in the first position like the demonstratives in DPs.
(iii) Compounds that denote attributes of the referent are sometimes head-initial (e.g. CHICKEN^SMALL 'chick'), sometimes head-final (YELLOW^WATERMELON 'melon') like TİD noun phrases that can occur in both Adj+N and N+Adj order (Özsoy & Nuhbalaoğlu, 2014).

In addition to the ordering pattern shared with different phrase types, the +human head-final compounds might be based on an analogy with the sign for PERSON that occurs finally in combination with another sign.

Meir et al. (2010) have found that in ABSL, compound order is influenced by headedness and Size and Shape Specifiers. For example, Size and Shape Specifiers occur as the final item in ABSL (WRITE^LONG-THIN-OBJECT 'pen', Sandler, Aronoff, Padden, & Meir, 2014: 262) and in ISL (Tkachman, 2016) as classifiers are in TİD. Conversely, Bauer (2014) notes that Size and Shape Specifiers occur as the first item in Yolngu Sign Language which is a shared sign language in North-East Australia (e.g. RECTANGULAR-OBJECT^TYPE 'computer', p. 212).

We see similar phenomena in spoken languages. Booij (2009) cites evidence that the head position in Mandarin Chinese compound is sensitive to the semantic structure of constituents. If constituents have a verb-argument relation, the compound is left-headed as in *jìn^dú* (prohibit^poison) 'ban sale and abuse of drugs' (Ceccagno & Basciano, 2009: 485) which is similar to the regularity (right-headedness) in compounds with verbal concepts (action/motion) in our TİD data. In Biak, an Austronesian language, the compound head position is sensitive to the semantic relationship between the

constituents. Specifically, when the two items have a part-whole relationship, the part is the second element as in *ai^snáw* (tree^branch) 'branch of a tree' (Van den Heuvel, 2006: 91-93). This phenomenon is similar to our finding that endocentric, exocentric, and attribute-denoting compounds have different positions for their heads.

The parallels that we demonstrated so far suggest that the position of the head need not be determined by a single abstract parameter in languages, but may be based on construction schemas. Whether compounds are formed in the syntax or in the lexicon, these parallels indicate that templates manifest themselves in both directions, which suggests a fuzzy continuum between syntax and morphology.

6 Conclusion

In this paper we classified 127 native compounds in TİD in order to understand whether the position of the head (in the sense of Bisetto & Scalise, 2005) was predictable from the semantic categorization of compounds. We found that the overwhelming majority of endocentric compounds were head-final, while exocentric compounds were typically head-initial. We discussed two further types of compounds, those which contained their hypernym, a type that we called descriptive compounds, and those that contain body contact as a bound morpheme, a type we named cranberry compounds. We also drew parallels with phrase structure and pointed to patterns that cut across compounding and phrase structure. More detailed work is needed to understand whether there is copying between morphology and syntax (in any direction), or whether there is an overarching structure that manifests itself throughout grammatical structure.

Moreover, as our research and the research of others show (cf. Brennan, 1990; Kan & Gökgöz, 2009), phonetic factors may also play a role in the ordering of the constituents. One of these is that, the constituent that is signed in a higher location tends to precede the one that has a lower point of articualtion.

In our investigation of native compounds in TİD, we left aside various other semantic relations between the components of compounds, such as antonymy, metonymy, and other semantic relations. We also left aside polymorphemic forms whose components are expressed simultaneously. These latter are interesting from a structural point of view as they are restricted in their phonotactics, specifically in parameters of handedness, handshape, and movement (Battison, 1978), but are structurally located on a fine line between blends and compounds (Taşçı & Göksel, 2014, Göksel & Taşçı, 2016). They are also semantically interesting as they may reveal contrasts with sequential compounds where both components are one-handed signs (Taşçı, Göksel, Gökgöz frth.). These are just a few of the examples which make it clear that

much more work needs to be done on the further types of compounds in sign languages.

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Appendix – A List of TİD Native Compounds (when n.a. occurs with fixed order compounds, it indicates double-headed or headless compounds. When it appears with free order, it means the head position is neither initial or final.)

Endocentric compounds other than the 'descriptive' type and exocentric compounds

#	Gloss	Translation	Head Position	Endocentricity	Flexibility of Order
1	GOLD^STORE	jewellery store	final	endo	fixed order
2	SOUND^ CL.TWO.VERTICAL.OBJECTS	loudspeakers	final	endo	fixed order
3	M^HALL	parliament	final	endo	fixed order
4	FACE^BEAUTIFUL	beautiful	final	endo	fixed order
5	CHICKEN^SMALL	chick	initial	endo	fixed order
6	CLOTHING^TIE-AT-THE-WAIST	cooking apron	initial	endo	fixed order
7	MEAT^OPERATE-MINCER	minced meat	initial	endo	fixed order
8	MEAT^COME-OUT-OF-MINCER	minced meat	initial	endo	fixed order
9	DEVICE-WITH-LID^COPY	scanner	initial	endo	fixed order
10	HORSE^OFFSPRING	foal	n.a.	endo	fixed order
11	SLEEP^CLOTHING	pajamas	n.a.	endo	free order
12	FOOD^DRESS	cooking apron	n.a.	endo	free order
13	TWO.STAR.PIP (on uniform)^SOLDIER	officer	n.a.	endo	free order
14	CL.DIAMOND.SHAPE^ROLL-OUT-DOUGH	baklava (a dessert)	n.a.	endo	free order
15	MONITOR^COMPUTER	monitor	n.a.	endo	free order
16	HORSE^SMALL	foal	n.a.	endo	free order
17	P^PERSON	staff	n.a.	endo	free order
18	R^CAR	Renault	n.a.	endo	free order
19	H^CAR	Honda	n.a.	endo	free order
20	C^WEAR	jacket	n.a.	endo	free order
21	HORSE^SMALL	foal	n.a.	endo	free order
22	SOUND^EMIT	loudspeakers	final	exo	fixed order
23	MAN^TALL	elder brother	initial	exo	fixed order
24	WOMAN^TALL	elder sister	initial	exo	fixed order

#	Gloss	Translation	Head Position	Endocentricity	Flexibility of Order
25	MAN^TALL2	elder brother	initial	exo	fixed order
26	MAN2^TALL2	elder brother	initial	exo	fixed order
27	WOMAN^TALL2	elder sister	initial	exo	fixed order
28	HEAD^STRONG	stubborn	initial	exo	fixed order
29	NECK^LONG	giraffe	initial	exo	fixed order
30	RED^CL.ROUND.OBJECT	tomato	n.a.	exo	fixed order
31	SOUR^BITTER/SOUR	pickle	n.a.	exo	fixed order
32	BITTER/SOUR^JAR	pickle	n.a.	exo	fixed order
33	İ^SEAL	imam	n.a.	exo	fixed order
34	BOOK^ARTICLE	code of law	n.a.	exo	fixed order
35	BINDI^CL.ROUND.OBJECT	India	n.a.	exo	fixed order
36	YELLOW^CL.ROUND.OBJECT	melon	n.a.	exo	fixed order
37	YELLOW2^ CL.ROUND.OBJECT	melon	n.a.	exo	fixed order
38	CT(nose)^POUR	gas	n.a.	exo	fixed order
39	TEAR^ PIECE.CL.ROUND.OBJECT	onion	n.a.	exo	fixed order
40	CT(mouth)^ CL.SHORT.THIN.OBJECT	pepper	n.a.	exo	fixed order
41	OPEN-LID^PHOTOCOPY	photocopy	n.a.	exo	fixed order
42	AIR^OPEN	window	n.a.	exo	fixed order
43	NECK^NECK.HEAD	giraffe	n.a.	exo	fixed order
44	V^RAKI	vodka	n.a.	exo	fixed order
45	T^BIG-STEERING-WHEEL	big rig	n.a.	exo	fixed order
46	CHOP-FOOD^HAT	cook (as vocation)	n.a.	exo	fixed order
47	GOLD^SILVER/NECKLACE	jewellery store	n.a.	exo	free order
48	YELLOW^CL.ROUND.OBJECT	melon	n.a.	exo	free order
49	YELLOW^WATERMELON	melon	n.a.	exo	free order
50	SOUND^ CL.RECTANGULAR.OBJECT	loudspeakers	n.a.	exo	free order
51	INSIDE.OF.CLOTH^ UNDERSHIRT	undervest	n.a.	exo	free order

Descriptive Compounds (Section 4.2)

#	Gloss	Translation	Head Position	Endocentricity	Flexibility of Order
52	WARM^SUN	sun	final	endo	fixed order
53	MILITARY-GREETING^ SOLDIER	soldier	final	endo	fixed order
54	WOOD^CARPENTER	carpenter	final	endo	fixed order
55	İ^İMAM	imam	final	endo	fixed order
56	CT(nose)^DIRECTOR	director	final	endo	fixed order
57	THICK-WOOL^BLANKET	blanket	final	endo	fixed order
58	GREENGROCER^GROCER	greengrocer	final	endo	fixed order
59	CL.ROUND.OBJECT^ ONION	onion	final	endo	fixed order
60	POTATO^CL.ROUND. OBJECT	potato	final	endo	fixed order
61	PLANT^TREE/FOREST	forest	final	endo	fixed order
62	BABY/OFFSPRING/SMALL^ CHILD	child	final	endo	fixed order
63	STEERING-WHEEL^BUS	bus	final	endo	fixed order
64	CL.RECTANGULAR.SHAPE^ CUPBOARD	cupboard	final	endo	fixed order
65	CT(nose)^PETROL	petrol	final	endo	fixed order
66	CT(neck)^SEAL/NOTARY	notary	final	endo	fixed order
67	CT(cheek)^CONTROL	control	final	endo	fixed order
68	CT(cheek)^LOOK-FOR	look for	final	endo	fixed order
69	HEAD/EXAGGERATE^ADD	exaggerate	final	endo	fixed order
70	HEAD^MEMORY/REMEMBER	remember, memory	final	endo	fixed order
71	HEAD^ MATCH/AGREEMENT	agreement	final	endo	fixed order
72	FACE^BAD/UGLY	ugly	final	endo	fixed order
73	FACE^BEAUTIFUL/GOOD	beautiful	final	endo	fixed order
74	FACE^ SMALL/BABY/YOUNG	young	final	endo	fixed order
75	BODY^STRONG/HEALTH	health/healthy	final	endo	fixed order
76	PURPLE^EGGPLANT	eggplant	final	endo	fixed order
77	CT(nose)^PECK/CHICKEN	chicken	final	endo	fixed order
78	MEAT^CUT/BUTCHER	butcher	final	endo	fixed order
79	BOUNCE^SHOOT-A-BASKET/BASKETBALL	basketball	final	endo	fixed order

#	Gloss	Translation	Head Position	Endocentricity	Flexibility of Order
80	P^CONGRESSMAN	political party	final	endo	fixed order
81	P^PARTY	party	final	endo	fixed order
82	HEAR^EMIT/LOUDSPEAKER	loudspeakers	final	endo	fixed order
83	KILOGRAM/GROCER^SELL/ GROCER	grocer	final	endo	fixed order
84	M^ SKETCH/PLAN/ARCHITECT	architect	final	endo	fixed order
85	PLANT^GRASS	grass	final	endo	fixed order
86	CT(nose)^GRASS	grass	final	endo	fixed order
87	SCHOOL^STUDENT	student	final	endo	fixed order
88	CL.RECTANGULAR.SHAPE^ OPEN-AND-CLOSE	window	final	endo	fixed order
89	CT(nose)^MATCH	match	final	endo	fixed order
90	EYE^GLOW/BRIGHTNESS	brightness	final	endo	fixed order
91	BOOK^ARTICLE/PROGRAM/ REGULATIONS	article of law	final	endo	fixed order
92	BOOK^ARTICLE/PROGRAM/ REGULATIONS	regulations	final	endo	fixed order
93	CT(forehead)^SINGLE/ALONE	single	final	endo	fixed order
94	CHOP-FOOD^LONG-HAT/COOK	cook	final	endo	fixed order
95	WATER^WAVE/SEA	sea	final	endo	fixed order
96	GAME^FIELD	field	final	endo	fixed order
97	CT(mouth)^CL.LONG.THIN. OBJECT/SAUSAGE	sausage	final	endo	fixed order
98	POTATO^PEEL	potato	initial	endo	fixed order
99	POTATO2^ CL.ROUND.OBJECT	potato	initial	endo	fixed order
100	MOSQUITO^BITE	mosquito	initial	endo	fixed order
101	SOFT/PILLOW^REST-ON-SOMETHING	pillow	initial	endo	fixed order
102	CLEAN^GOOD	clean	initial	endo	fixed order
103	SOFT/PILLOW^ CL.RECTANGULAR.SHAPE	pillow	initial	endo	fixed order
104	Ç/GARBAGE^THROW	garbage	initial	endo	fixed order
105	DOCTOR1^DOCTOR2	doctor	n.a.	endo	free order
106	FOOD^ FRUIT/GREENGROCER	greengrocer	n.a.	endo	free order
107	COAT/OVERCOAT^LONG	overcoat	n.a.	endo	free order
108	TURBAN/IMAM^ MUSLIM/ISLAM	imam	n.a.	endo	free order

#	Gloss	Translation	Head Position	Endocentricity	Flexibility of Order
109	PIP.WITH.TWO.STARS/OFFICER^SOLDIER	officer	n.a.	endo	free order
110	ANIMAL^DOG/WOLF	wolf	n.a.	endo	free order
111	CL.LONG.RECTANGULAR.SHAPE^SWIM	swimming pool	n.a.	endo	free order
112	CL.RECTANGULAR.SHAPE^PROJECTOR	projector	n.a.	endo	free order
113	COMPUTER^OPEN-LID/LAPTOP	laptop	n.a.	endo	free order
114	FOOD^FAMILY/KITCHEN	kitchen	n.a.	endo	free order
115	LONG-HAT/COOK^STIR/COOK	cook	n.a.	endo	free order
116	AIRPLANE^PILOT	pilot	n.a.	endo	free order
117	HEAR^ROTATE-SWITCH-RADIO	radio	n.a.	endo	free order
118	V^DRINK	whiskey	n.a.	endo	free order
119	Ç^WEAR-SOMETHING-UNDER-THE-WAIST	socks	n.a.	endo	free order
120	CT(mouth)^BITTER	bitter	n.a.	endo	free order
121	GRASS/CUT-GRASS^GRASS	grass	n.a.	endo	free order
122	SMALL/BABY^PAT-BABY/BABY	baby	n.a.	endo	free order
123	PARLIAMENT^PEOPLE-SITTING-IN-ROWS	parliament	n.a.	endo	free order
124	VODKA^V/VODKA/WHISKEY	vodka	n.a.	endo	free order
125	TURBAN/IMAM^SEAL	imam	n.a.	endo	free order
126	GREEN^GRASS	grass	n.a.	endo	free order
127	TABLE^PLAN/ARCHITECT	architect	n.a.	endo	free order